WE CLAIM:

1. A process for the regeneration of a hydrocarbon conversion catalyst in the presence of halogen, the process comprising:

(a) contacting a regeneration inlet stream comprising halogen with catalyst in a catalyst bed to at least partially regenerate the catalyst in the catalyst bed, and withdrawing a regeneration effluent stream comprising halogen from the catalyst bed;

(b) contacting a first portion of the regeneration effluent stream with adsorbent in a first adsorbent bed, removing halogen from the first portion of the regeneration effluent stream and adsorbing halogen on adsorbent in the first adsorbent bed, and recovering an adsorption effluent stream from the first adsorbent bed;

(c) contacting a second portion of the regeneration effluent stream with adsorbent in a second adsorbent bed, the adsorbent in the second adsorbent bed having halogen adsorbed thereon, desorbing halogen from the adsorbent in the second adsorbent bed, and withdrawing a desorption effluent stream comprising halogen from the second adsorbent bed; and,

(d) forming the regeneration inlet stream from at least a portion of the desorption effluent stream.

2. The process of Claim 1 wherein at least one of the adsorbent in the first adsorbent bed and the adsorbent in the second adsorbent bed is selected from the group consisting of a molecular sieve, silica gel, carbon, and alumina.

3. The process of Claim 1 further characterized in that the functions of the first adsorbent bed and the second adsorbent bed are at least periodically shifted by operating the first adsorbent bed as the second adsorbent bed and operating the second adsorbent bed as the first adsorbent bed.

4. The process of Claim 3 wherein at least one of the adsorbent in the first adsorbent bed and the adsorbent in the second adsorbent bed comprises a hydrocarbon conversion catalyst.

5. The process of Claim 3 wherein the catalyst and at least one of the adsorbent in the first adsorbent bed and the adsorbent in the second adsorbent bed have the same composition.

6. The process of Claim 3 further characterized in that the adsorbent in the second adsorbent bed has a pre-adsorption halogen content prior to the shifting of functions, the adsorbent in the first adsorbent bed has a post-adsorption halogen content prior to the shifting of functions, and the difference between the pre-adsorption halogen content and the post-adsorption halogen content is from about 0.2 to about 2.0 wt-% halogen, based on the weight of adsorbent.

7. The process of Claim 1 wherein the catalyst is selected from the group consisting of a reforming catalyst, an isomerization catalyst, and a dehydrogenation catalyst.

8. The process of Claim 1 wherein the at least partial regeneration of the catalyst is selected from the group consisting of burning carbon deposits on the catalyst, redispersing a metal on the catalyst, adding halogen to the catalyst, drying the catalyst, and reducing a metal on the catalyst.

9. The process of Claim 1 wherein the regeneration inlet stream comprises a component selected from the group consisting of oxygen, hydrogen, nitrogen, and a C_1-C_5 hydrocarbon.

10. The process of Claim 1 further characterized in that at least about 80 percent of the halogen in the first portion of the regeneration effluent stream is adsorbed on the adsorbent in the first adsorbent bed.

11. The process of Claim 1 further characterized in that the first adsorbent bed operates at adsorption conditions comprising a temperature of less than about 482°C and a molar ratio of water to halogen of more than 5:1.

12. The process of Claim 1 further characterized in that the adsorbent in the first adsorbent bed has a capillary condensation temperature at the adsorption conditions, and the adsorption conditions comprise a temperature of greater than the capillary condensation temperature.

13. The process of Claim 1 wherein the halogen is chlorine or fluorine.

14. The process of Claim 1 wherein the halogen in the regeneration effluent stream is in a component selected from the group consisting of hydrogen chloride and molecular chlorine.

15. The process of Claim 1 further characterized in that the regeneration inlet stream has a regeneration inlet temperature and a regeneration inlet molar ratio of water to halide, the desorption effluent stream has a desorption effluent temperature and a desorption effluent molar ratio of water to halide, the difference between the regeneration inlet temperature and the desorption effluent temperature is less than about 20°C, and the difference between the regeneration inlet molar ratio and the desorption effluent molar ratio is less than about 20:1.

16. The process of Claim 1 further characterized in that the first adsorbent bed operates at adsorption conditions comprising an adsorption temperature and an adsorption molar ratio of water to halogen, the second adsorbent bed operates at desorption conditions comprising a desorption temperature and a desorption molar ratio of water to halogen, the difference between the desorption temperature and the adsorption temperature is more than about 55°C, and the ratio of the adsorption molar ratio to the desorption molar ratio is from about 0 to about 2.

17. The process of Claim 1 further characterized in that a component consisting of at least one of water and a compound that can react to form water is introduced into the process and water contacts the adsorbent in the second adsorbent bed.

18. The process of Claim 1 further characterized in that at least one of the first portion of the regeneration effluent stream and the second portion of the regeneration effluent stream is cooled.

19. A adsorptive method for recovering a chlorine-containing material from the outlet stream of a cyclic regeneration operation of a hydrocarbon conversion process using a catalyst, the method comprising:

(a) passing hydrocarbons to a first catalyst bed containing catalyst and converting the hydrocarbons;

(b) passing a regeneration inlet stream comprising a chlorine-containing material to a second catalyst bed containing catalyst, at least partially regenerating the catalyst in the second catalyst bed at regeneration conditions and in the presence of chlorine-containing material, and recovering from the second catalyst bed a regeneration effluent stream comprising chlorine-containing material;

(c) passing a first portion of the regeneration effluent stream comprising chlorine-containing material to a first adsorbent bed containing adsorbent, removing at least about 80 percent of the chlorine-containing material in the first portion of the regeneration effluent stream and adsorbing chlorine-containing material on the adsorbent in the first adsorbent bed, and recovering an adsorption effluent stream from the first adsorbent bed;

(d) contacting a second portion of the regeneration effluent stream comprising chlorine-containing material to a second adsorbent bed containing adsorbent, the adsorbent in the second adsorbent bed having chlorine-containing material adsorbed thereon, desorbing chlorine-containing material from the adsorbent in the second adsorbent bed, and withdrawing a desorption effluent stream comprising chlorine-containing material;

(e) forming the regeneration inlet stream from at least a portion of the desorption effluent stream;

(f) at least periodically shifting the functions of the first adsorbent bed and the second adsorbent bed by operating the first adsorbent bed to function as the second adsorbent bed and operating the second adsorbent bed to function as the first adsorbent bed; and

(g) at least periodically shifting the functions of the first and second catalyst beds by operating the first catalyst bed to function as the second catalyst bed and operating the second catalyst bed to function as said the catalyst bed.

20. The method of Claim 19 wherein the chlorine-containing material comprises at least one of hydrogen chloride and molecular chlorine.